



## What and why

- The extent to which primary care clinicians are involved in insulin management will vary but inevitably almost all doctors, nurses and increasingly pharmacists will, at some point, be required to make decisions about insulin therapy, whether that be offering dose adjustment advice to individuals during illness or following an episode of hypoglycaemia, issuing or dispensing a repeat prescription or even administering an insulin injection.
  - 4.7 million people in the UK have diabetes and the numbers are rising rapidly<sup>1</sup>.
  - Between 1991 and 2010, UK insulin users trebled from 136 800 to 421 300<sup>2</sup>.
- Insulin is a high-risk medication. With the recent launches of new insulin concentrations and biosimilar insulins, it is crucial for all healthcare practitioners (HCPs) involved in prescribing, preparing or administering insulin to possess the knowledge and competency to do so safely.

**Citation:** Diggle J (2019) How to minimise insulin errors. *Diabetes & Primary Care* 21: 149–50

## The impact of insulin errors

The National Reporting and Learning System (NRLS) receives patient safety incidents reported from NHS organisations in England. From 2013 to 2014, it received 5990 such reports involving insulin in the community nursing, medical and therapy service;

community pharmacy; and general practice settings. These included 8 incidents of severe harm and 245 of moderate harm. Most occurred during insulin administration, while others were caused by prescribing errors or were related to the dispensing of insulin.

## Main causes of insulin error<sup>3</sup>

Error type	Causes
Wrong dose	<ul style="list-style-type: none"> <li>● Incorrect prescription (especially on admission to hospital).</li> <li>● Abbreviation of “units” (poor handwriting, with “U” or “IU” read as 0 or 10).</li> <li>● Incorrect monitoring of blood glucose and dose adjustment of insulin.</li> <li>● Poor documentation of dose administration (especially inpatient medicine charts).</li> <li>● Duplicate dose administration.</li> <li>● Errors in calculation of insulin doses for intravenous infusions.</li> <li>● Incorrect programming of electronic infusion devices.</li> </ul>
Omitted or delayed insulin	<ul style="list-style-type: none"> <li>● Insulin not prescribed on hospital admission.</li> <li>● Failure to prescribe or supply the correct insulin preparation or device.</li> <li>● Prescribed insulin product not available (during hospital stay or at discharge).</li> <li>● Confusion over administration in patients designated “nil by mouth”.</li> <li>● Insulin not administered at appropriate time (especially in relation to meals).</li> </ul>
Wrong insulin product	<ul style="list-style-type: none"> <li>● “Look alike/sound alike” names (described in over 2000 incidents).</li> </ul>

In 2010, a Rapid Response Report<sup>3</sup> was issued demanding the following:

1. All regular and single insulin (bolus) doses are measured and administered using an insulin syringe or commercial insulin pen device. Intravenous syringes must never be used for insulin administration.
  2. The term “units” is used in all contexts. Abbreviations, such as “U” or “IU”, are never used.
  3. All clinical areas and community staff treating patients with insulin have adequate supplies of insulin syringes and subcutaneous needles, which staff can obtain at all times.
  4. An insulin syringe must always be used to measure and prepare insulin for an intravenous infusion. Insulin infusions are administered in 50-mL intravenous syringes or larger infusion bags. Consideration should be given to the supply and use of ready-to-administer infusion products (e.g. prefilled syringes of fast-acting insulin 50 units in 50 mL sodium chloride 0.9%).
  5. A training programme should be put in place for all healthcare staff (including medical staff) expected to prescribe, prepare and administer insulin.
  6. Policies and procedures for the preparation and administration of insulin and insulin infusions in clinical areas are reviewed to ensure compliance with the above.
- In 2017, NICE published a key therapeutic topic<sup>4</sup> summarising the evidence base on safer insulin prescribing. It emphasises that individuals using insulin should be given adequate information (e.g. about hypoglycaemia, sick-day rules, notifying the DVLA and how to use their insulin) and that clinicians should be aware of the different types of insulins available.

## What is new?

### Biosimilars

A “biosimilar” is a biological copy that is not identical, but demonstrates similarity, to the original product in terms of quality, efficacy and safety. The expiration of patent protection for a number of insulin preparations has led to the launch of several biosimilar insulins including:

- **Abasaglar**<sup>®</sup> (insulin glargine 100 units/mL)
- **Semglee**<sup>®</sup> (insulin glargine 100 units/mL)
- **Insulin lispro Sanofi** (insulin lispro 100 units/mL)

### New insulin concentrations

Most of the commonly used insulins provide 100 units per mL. However, the following higher concentration insulins are available:

- Toujeo (insulin glargine 300 units/mL)
- Tresiba U200 (insulin degludec 200 units/mL)
- Humalog U200 (insulin lispro 200 units/mL)

Insulin type	Insulin mode of action		
	Mealtime/bolus	Pre-mixed	Basal
<b>Human</b>	Humulin® S Actrapid® Insuman® Rapid	Humulin® M3 Insuman® Comb 15 Insuman® Comb 25 Insuman® Comb 50	<u>Intermediate-acting</u> Humulin® I Insulatard® Insuman® Basal
<b>Analogue</b>	<u>Rapid-acting</u> Humalog® U100 Humalog® U200 Insulin lispro Sanofi NovoRapid® Apidra®  <u>Ultra-rapid-acting</u> Fiasp®	Humalog® Mix25 Humalog® Mix50 NovoMix® 30	<u>Long-acting</u> Abasaglar® Semglee® Lantus® Toujeo® U300 Levemir®  <u>Ultra-long-acting</u> Tresiba® U100 Tresiba® U200

#### References

- <sup>1</sup>Diabetes UK (2019) *Number of people with diabetes reaches 4.7 million*. Available at: <https://bit.ly/345WIK2>
- <sup>2</sup>Holden SE et al (2014) How many people inject insulin? UK estimates from 1991 to 2010. *Diabetes Obes Metab* **16**: 553–9
- <sup>3</sup>National Patient Safety Agency (2010) *Rapid Response Report: Safer administration of insulin*. Available at: <http://bit.ly/16ncnuE>
- <sup>4</sup>NICE (2017) *Safer insulin prescribing* (KTT20). Available at: [www.nice.org.uk/guidance/ktt20](http://www.nice.org.uk/guidance/ktt20)
- <sup>5</sup>PCDS (2015) PCDS statement on the drawing-up of insulin using insulin syringes from insulin pen cartridges and prefilled pens. *Diabetes & Primary Care* **17**: 49–51, <http://bit.ly/2X4uUdD>
- <sup>6</sup>NHS Improvement (2016) *Risk of severe harm and death due to withdrawing insulin from pen devices*. Available at: <https://bit.ly/2pbSLf8>
- <sup>7</sup>Health and Safety Executive (2013) *Health and Safety (Sharp Instruments in Healthcare) Regulations 2013. Guidance for employers and employees*. Available at: <https://bit.ly/32HTrqo>



### To avoid any confusion, ALWAYS prescribe insulin by the brand name.

Consult the product SmPC (available at [www.medicines.org.uk](http://www.medicines.org.uk)) for the most up-to-date product information.

**Be aware** that several insulins have similar-sounding names, but very different time–action profiles. Prescribing or administering the wrong insulin can cause serious harm.



**It is good practice** to issue an insulin passport when insulin is initiated or changed. Credit card-sized insulin passports for all insulins are available to HCPs directly from the manufacturers.

## Insulin safety checklist

### If you administer insulin:

- Be aware that in care home settings the patient may not be in their own room or may not be able to confirm their identity – always confirm this before administering the insulin.
- Check that the prescription chart is matched to the correct individual.
- Ensure the insulin has been stored correctly and is within expiry date.
- Check that it is the correct insulin (as per prescription chart) and in the correct delivery device.
- Measure blood glucose level BEFORE giving insulin.
- Check that the timing of the injection is appropriate in relation to food intake, where this is relevant.
- Check that the correct dose is drawn up/dialled – the medicine chart MUST clearly indicate the number of units with no abbreviations of

- this term and the insulin should be prescribed by brand name.
- Use best practice injection technique** (see **Resources** box below).
- Never withdraw insulin from a pen cartridge or disposable pen.\*
- Ensure an insulin syringe, NOT an intravenous syringe, is used where insulin is prescribed in vials.
- Use a safety-engineered device when administering insulin to a third party (these should be provided by the employer to reduce the risk of needlestick injury)<sup>7</sup>.
- Never recap pen needles.
- Dispose of sharps safely, as per local guidelines.

### Where an individual self-injects insulin, ensure they understand:

- Which insulin they are taking (including the brand name and device).

- When the insulin should be given (e.g. 30 minutes before meals).
- What dose should be delivered (e.g. based on their self-monitored blood glucose levels, food intake, activity levels, etc).
- How their particular insulin works.
- The risks of hypoglycaemia, its signs and symptoms, how to prevent it, and how to treat it.
- Correct injection technique (see **Resources**).
- Safe disposal of sharps.



\*In 2015, the PCDS issued a position statement on this dangerous practice<sup>5</sup>. In 2016, NHS Improvement<sup>6</sup> warned of the risk of **severe harm** and **death** if insulin is withdrawn directly from a pen device or pen cartridge using an insulin needle and syringe.

## Resources

No matter how efficacious an insulin is, its effects will be suboptimal if it is not administered correctly. **Correct injection technique is key.**

For best practice injection technique, refer to:

- How to support best practice injection technique  
A quick reference guide from *Diabetes & Primary Care*: <http://bit.ly/2VKvUTN>
- *Injection Technique Matters: Best Practice Guideline to Support Correct Injection Technique in Diabetes Care* and *The Patient Toolkit* can be downloaded at [www.trend-uk.org](http://www.trend-uk.org).



## Online learning

If you **EVER** prescribe, prepare or administer insulin, make sure you have undertaken recent insulin training.

*The Six Steps to Insulin Safety* is a **FREE e-learning module** for HCPs. The independent content was developed by the Primary Care Diabetes Society, in association with TREND-UK, with the aim of reducing insulin errors in clinical practice.